ABSTRACT

All Borrelia burgdorferi sensu lato isolates characterized to date have one or a combination of several major outer surface proteins (Osp). Mutants of B. burgdorferi lacking Osp proteins were selected with polyclonal or monoclonal antibodies at a frequency of 10-6 to 10-5. One mutant that lacked OspA, B, C and D was further characterized in the present study. It was distinguished from the OspA+B+ cells by its (i) auto-aggregation and slower growth rate, (ii) decreased plating efficiency on solid medium, (iii) serum- and complement-sensitivity, and (iv) diminished capacity to adhere to human umbilical vein endothelial cells. The Osp-less mutant was unable to evoke a detectable immune response after intradermal live cell immunization even though mutant survived in the skin the same duration as wild-type cells. Polyclonal mouse serum raised against Osp-less cells inhibited growth of the mutant but not of wild-type cells, an indication that other antigens are present on the surface of the Osp-less mutant. Two different classes, A and B, of monoclonal antibodies (mAb) with growth inhibiting properties for mutant cells were produced. Class A mAbs bound to 13 kDa surface proteins of B. burgdorferi sensu stricto and of B. afzelii. The minimum inhibitory concentration of the Fab fragment of one mAb of this class was 0.2 µg/ml. Class B mAbs did not bind by Western Blot to B. burgdorferi cells but reacted with cells in an unfixed cell immunofluorescence assay and growth inhibition assay. These studies revealed hitherto unknown functional aspects of Osp proteins, notably serum-resistance, and indicated that in the absence of Osp proteins other antigens are expressed or become accessible at the cell's surface.